Nikon DP-1 meter adjustment and cleaning procedure

By Glen Walpert, May 1999

About this document:

This document was written by a camera repair hobbyist as a random act of senseless kindness. It was prepared without any information from Nikon, Inc., and is provided without any guarantee as to completeness or accuracy.

How the Nikon DP-1 lightmeter works:

Refer to the schematic below. In both test and meter modes, the circuit is a voltage divider. The meter movement is centered when it has about 0.025 volts across it, at about 16 micro-amps.

When the test button is pressed, current flows from battery negative, through test adjust trimpot, through the switch and then through the meter to case ground (battery positive.

CAUTION: Note that .025 volts at 16 micro-amps is much less than what most ohmmeters will put out. Be careful not to put an ohmmeter across the meter even indirectly. Checking the ring resistor or meter adjust resistor with an ohmmeter can destroy the meter movement, if the battery test button is not pressed to disconnect the meter from those resistors during resistance checks. Checking the meter directly with an ohmmeter is very likely to destroy it. It is best to perform resistance of the ring resistor or meter adjust resistor with a small plastic or paper strip holding the test switch in the middle position, connected to neither the normal or test contacts.

The best way to check the meter for continuity is to check voltage across the meter with a 3 volt or less battery temporarily clipped with - to the meter top half test contact and + to the ground contact (the ones that connect to the meter bottom half). Press the test switch to complete the normal test circuit. If the meter is open, full battery voltage will be imposed on the meter with no meter movement.

In meter mode, with the test button not pressed and the camera power switch on, the voltage divider is the two CdS photocells (60% center and 40% full frame) and the CdS trim resistors, against the main potentiometer and the meter adjust trimpot.

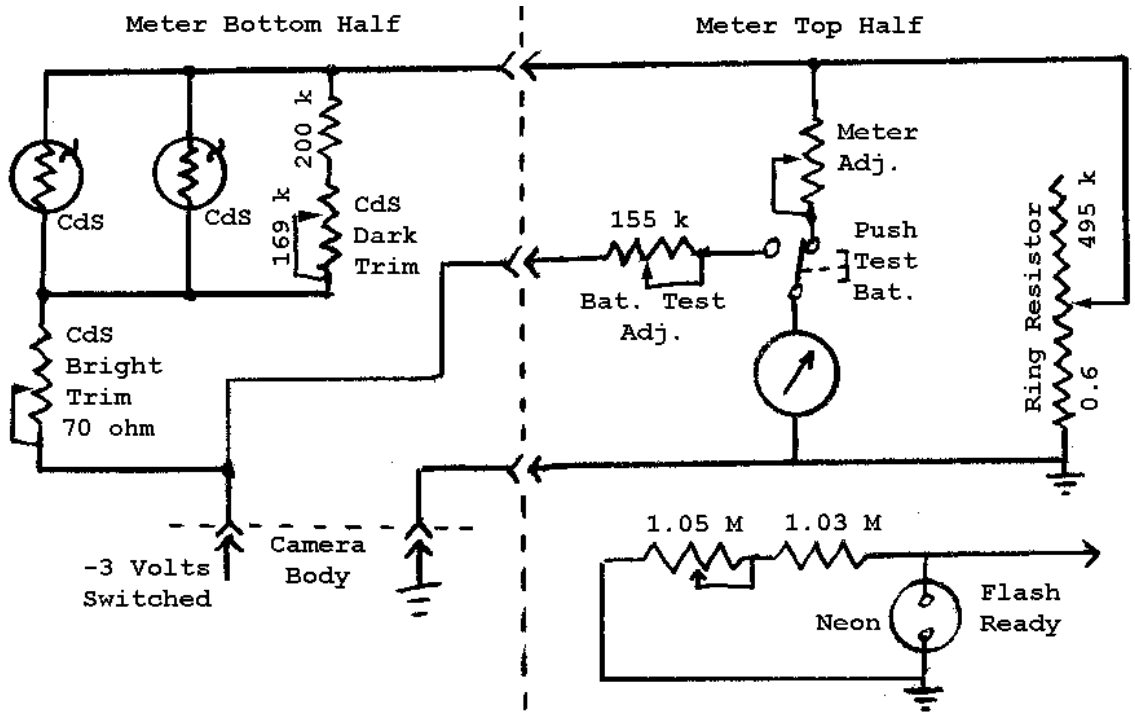
The aperture lever, which moves the wiper, and the shutter speed & ASA setting, which turns the potentiometer resistive element, operate the ring resistor. At somewhere around f/1.2, 2 sec, ASA 400 it is approx. 495K (maximum), and at around f/32, 1/2000 sec, ASA 400 it is approx. 0.6 ohms (minimum). I'm not sure I got those settings exactly right (with the meter off the camera), but you should be able to see the ends of the potentiometer element easily, and check for maximum and minimum resistance at the crossover.

There are no stops, the potentiometer will wrap around from maximum to minimum at long exposures and wide apertures, causing the meter to stop functioning (needle will drop to off

position).

The photocell resistance (both cells) varies from over 4 million ohms in a fairly dark room to less than 200 ohms when the meter is held about 6 inches from a 60-watt bulb.

The above measurements are from a single working meter. Small variance can be expected from meter to meter.



Nikon DP-1 Meter Schematic

Troubleshooting:

Check your batteries, they should be about 1.5 volts each, and you should have -3 volts on the meter power contacts at the top of the camera body when the film advance lever is pulled out to the on position.

Meter completely dead - this could be an open circuit anywhere, including the meter movement. Check the entire circuit.

Test function works but meter reads erratically or not at all - bad contact on main potentiometer or poor connection; disassemble, inspect and clean.

Adjustment (meter on camera):

Peel off the leather meter cover and remove the small oval metal plate covering the adjustments. Two trim potentiometers will be accessible, the left trim is for meter test and the right trim is for meter sensitivity. The adjustments are independent and can be done in any order.

(Note: It is not necessary to remove the leather cover to disassemble and clean the DP-1.)

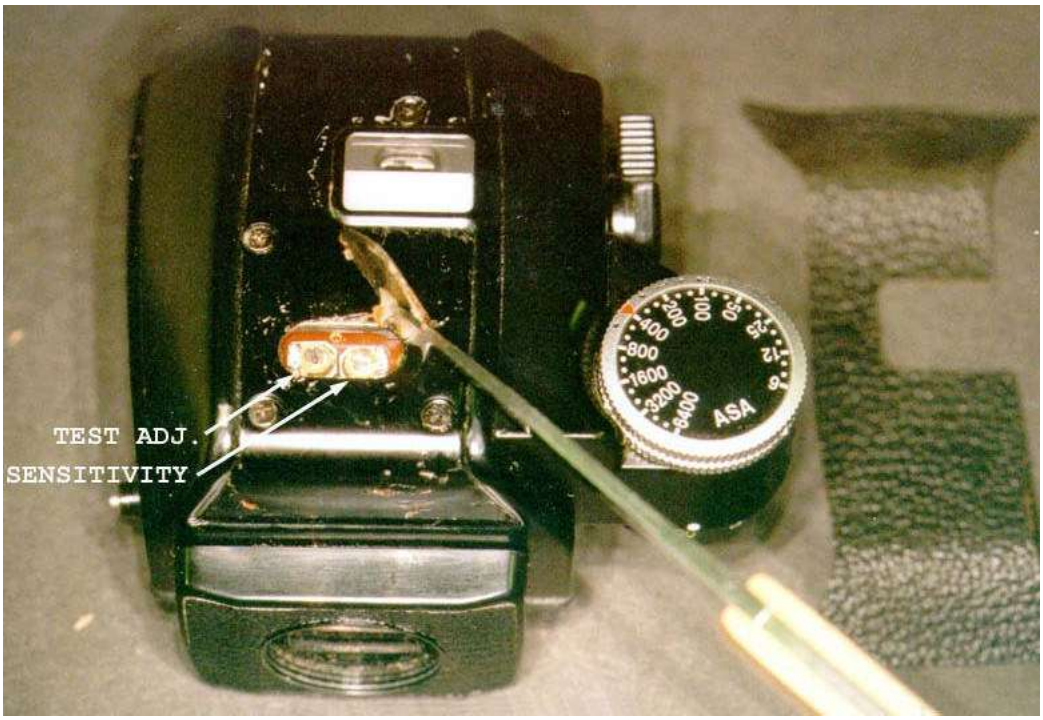


Fig. 1 - DP-1 adjustment locations

Adjustment should be done with fresh batteries.

Set the meter test trim so that the needle is centered when the test button is pressed.

Focus the camera (full frame) on an evenly illuminated 18% gray card, and adjust the sensitivity to agree with a known accurate meter. If you don't have a known accurate meter, you can make an approximate setting by using film manufacturers recommended setting for direct sunlight. For example, set the camera to ASA 100, 1/125 sec, f/16, and adjust the meter to center the needle when aimed at a gray card in direct sunlight. You could then make fine adjustments based on test shots, for example, if tests indicate you need 1/2 stop more exposure, set up with the gray card, center the needle, open up 1/2 stop, and re-center the meter using the sensitivity trim adjustment.

The two CdS trimpots are only accessible with the meter disassembled. These trimpots should only need adjustment if the CdS cells are replaced, and the adjustment would normally be done with a calibrated light box. If you check the meter sensitivity over it's full range, and find that the meter is off at the ends after adjusting the main sensitivity adjustment to be correct in the middle, it should be possible to trim the dark or bright sensitivity with a trial-and-error procedure. Decreasing the resistance of either trim will increase the meter sensitivity at that end.

If meter cannot be adjusted, disassemble, clean and inspect.

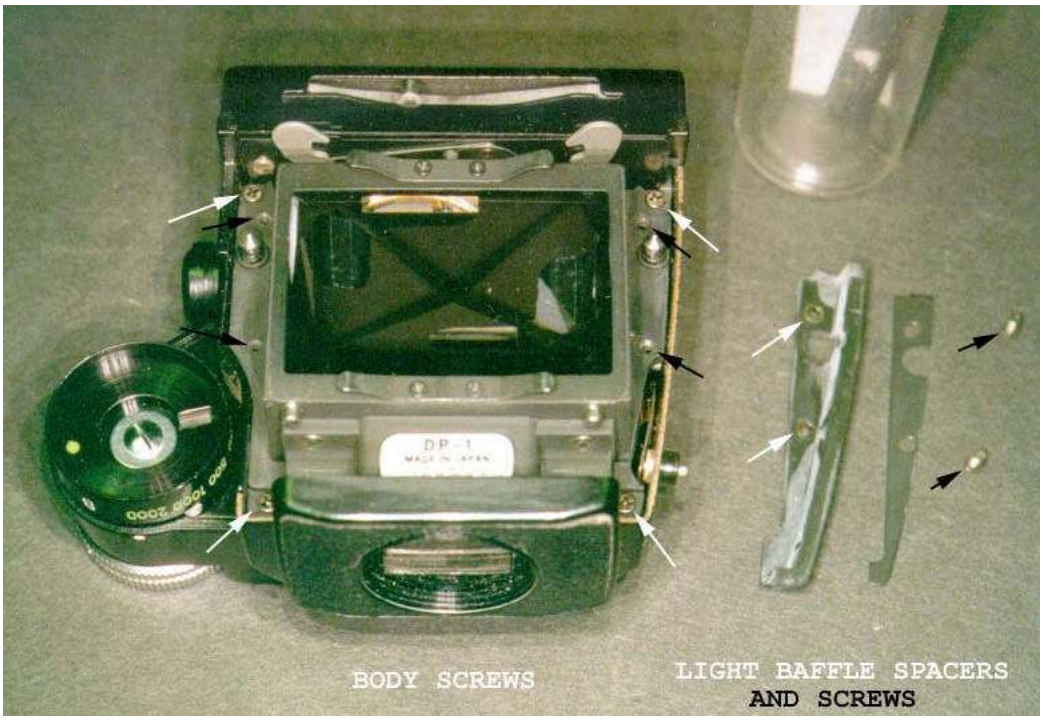


Fig. 2 - DP-1 bottom view

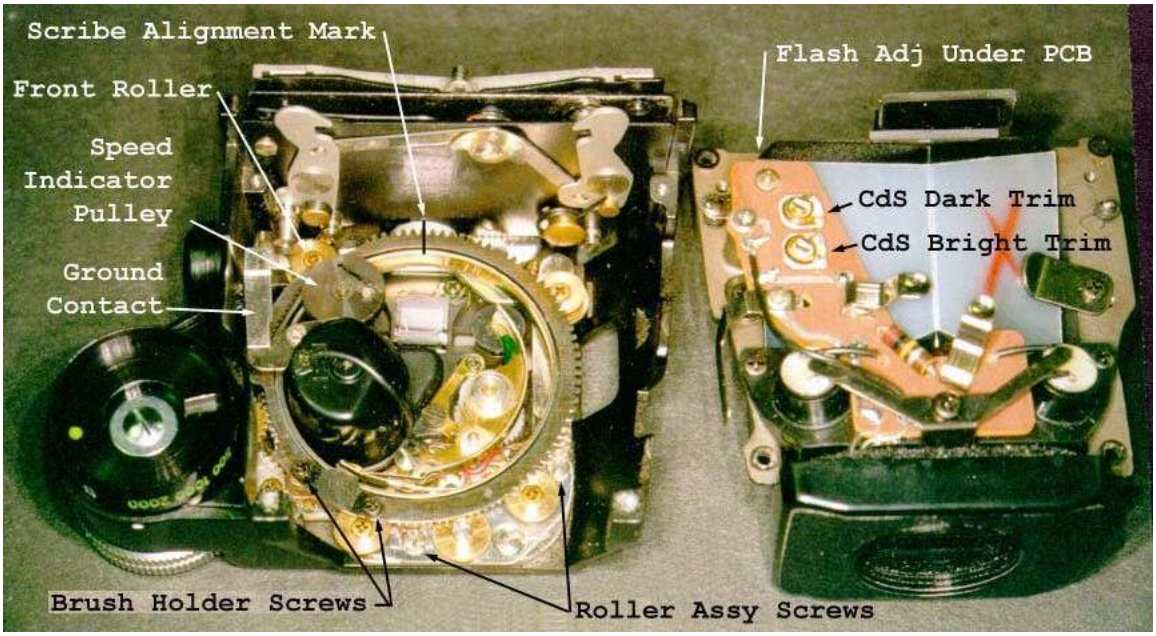


Fig. 3 - DP-1 split - interior view

Disassembly:

With meter removed from camera and turned upside down, remove the 4 light baffle screws, retainer plates, and rubber light baffles. Do not loose the 4 steel spacers that fit in the baffles and prevent the screws from crushing the rubber. Separate the two meter halves.

Press in the lens aperture lug to release the aperture mechanism, positioning the brush assembly as shown in Fig. 3, and allow the shutter speed to go to 1/2000 (spring-loaded position). Scribe small alignment marks on the white plastic aperture gear, the brush holder ring, and the ring resistor, so that they can be returned to the exact same position. (Scribing with a diamond or carbide scriber is preferable to a marking pen or paint, which might wash off during cleaning.)

Remove the brush holder, being careful not to bend the brushes.

Remove the ground contact and the speed indicator pulley. It is not necessary to remove the string from the speed indicator pulley, but it is necessary to remove both the clip and washer before the pulley will remove easily.

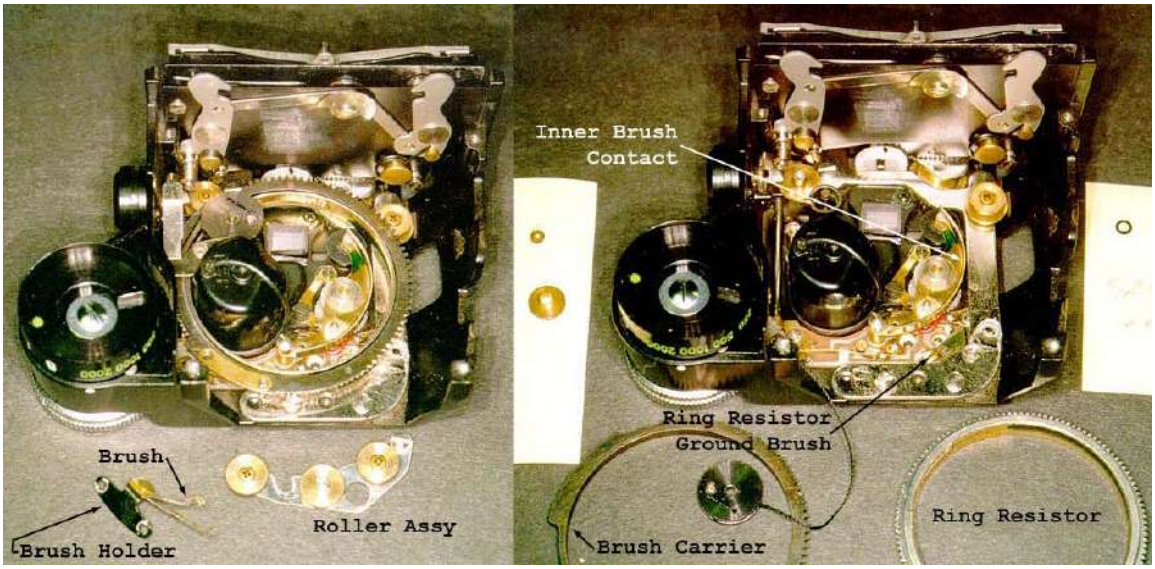


Fig. 4 - DP-1 ring resistor removal

Remove the Front Roller (see figures 3 and 4) and the rear Roller Assembly, which guide the brush carrier and ring resistor.

Lift out the Brush Carrier ring and the Ring Resistor, to reveal the Ring Resistor Ground Brush under the ring resistor. This brush was the problem in this particular meter and it is probably a common problem in DP-1's in general. Examination under a microscope or strong magnifier revealed that the ground brush was only making contact on the inner corner, due to the angle it was bent to at the factory. The gold plating had worn away from this corner, and the base metal underneath had corroded, producing a poor, intermittent contact. Specks of gold plating could be seen rubbed off on the ring resistor bottom surface, which had an excessively rough surface for its intended function as a sliding electrical contact (compare to the finish on the Inner Brush Contact).

The solution to the ground brush contact problem is to bend the ground contact so that a new section with intact gold plating makes contact with the ring resistor. Twist the contact so that it is nearly flat and both halves of the split section make contact with the ring resistor.

Polish the contact surface of the ring resistor slightly to remove all traces of transferred gold,

being careful not to wear through the thin nickel plating of the brass ring resistor. Rubbing lightly on 600 grit or finer sandpaper will do, and/or polish with jewelers rouge on a piece of paper or cloth on a flat surface. Clean off all abrasive residues, then burnish by rubbing on plain dry paper on a flat surface. The better the polish, the longer the re-bent ground contact will last; however polishing through the nickel plating will ruin the ring resistor, so do not attempt to remove all of the factory scratch marks; just smooth them out a bit.

Cleaning:

Clean all parts with tape head cleaner, alcohol, or a non-residue electronic parts cleaner, using lintless swabs or wipers. Be very careful of the delicate ring resistor element. Do not use any lubricant on electrical contacts; it will attract dust and cause wear. Do not use any spray cleaner, especially on the bottom half, there is risk of getting cleaner and dirt on optical surfaces which are difficult to access.

Reassemble the meter in the reverse order of disassembly, starting with the ring resistor, brush carrier and guide rollers. Apply a tiny bit of oil to the inside only of the ring resistor guide rollers, and adjust the roller assembly position for smooth operation with no play. A light sewing machine oil is good, it can be applied sparingly at the edge of the roller mounting screw head, using a flattened wire dipped in oil, after roller assembly.

Set the shutter speed indicator pulley on its shaft and rotate the indicator by grabbing the shaft below the pulley with tweezers and rotating it counter-clockwise. Hold the partially rotated indicator in position with light pressure on the top of the pulley, while shifting grip with the tweezers, until it is rotated to the 1/2000 position, where the alignment pin will drop into the hole in the pulley. Replace the washer and clip.

Verify that the ring resistor operates smoothly over its full range, and that it's resistance varies continuously from maximum to minimum with no jumpiness or irregularities. Be sure the meter movement is disconnected while measuring resistance, with a paper strip holding the test switch contact open. If all checks out, complete reassembly and check adjustment.

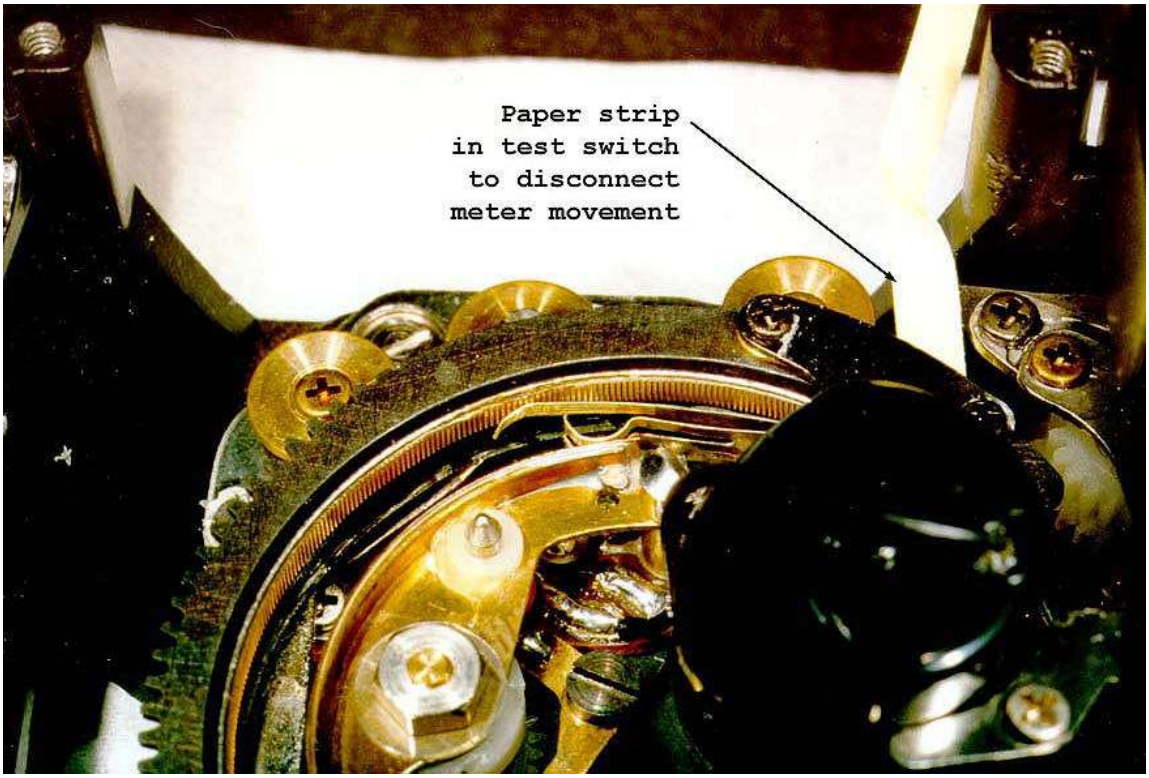


Fig. 5 - DP-1 ring resistor brush